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ABSTRACT

This primer is intended to acquaint public, academic and special librarians with the current state of the art in microform technology. Brief discussion is given of the advantages and disadvantages, economics, reading and printing capabilities, continuous and unitized microforms and the various analogies of microfilm technology to other technology. Suggestions for keeping current are included. (AB)

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The Microfilm Technology Primer On Scholarly Journals

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Foreword

The purpose of this pamphlet is to help fill the gap in the technical knowledge of librarians, information supervisors, and their staffs. For hundreds of years information professionals have been concerned only with the bound volumes. They have dedicated themselves to the physical care, maintenance and systematic order by author, title and subject. One need only to visit a firm or institution that has a sizeable collection, organized and directed by a knowledgeable and alert librarian, to receive a rich and fruitful experience. The organization that needs facts and information instead of guesses and opinions finds the well organized library the most efficient research tool and the greatest economy in time and effort. It contributes to three basic processes essential to civilization:

1. The discovery of knowledge.
2. The conservation of knowledge.
3. The transmission of knowledge.

The use of Public, Academic and Special Libraries is increasing at a tremendous rate. The reason can be attributed to a threefold explosion - - population, education and publication. It is little wonder that the information professional has insufficient time to keep pace with the technological maze that will in time replace the preponderance of bound volumes as known to him. It is for this reason we dedicate the Microfilm Technology Primer to all overworked librarians, information specialists and their unrelenting staffs.

September, 1969

Acknowledgements

It is characteristic of a systems person to become a collector of ideas, of other peoples best methods, and that these become indistinguishably intertwined with ones own approaches.

Certainly the writer of this pamphlet must acknowledge his indebtedness to a multitude of librarians and information professionals for all or substantial parts of many suggestions in these pages. Special thanks is due to Mrs. Virginia Duncan, E. I. DuPont, Mr. Leo Harper, Westinghouse, Mr. Ben Weil, Esso and Mr. Joseph Kuney of the American Chemical Society for the many thoughts and assists they have contributed.

Time, place and setting

It is 1969, the place is every Public, Academic and Research Library where titles are gathered together in the name of research and development of products or minds. The setting is the threshold of the atomic era, when more active scientists are alive in the current year than the sum total of all years heretofore. We have become a systems conscious society, controlled, regulated and measured by the lightening speed of the giant computer. It has reduced many laborious and repetitive tasks to square/round holes in cards and bits on magnetic tapes. It even has its own more efficient language with which to speak to other computers over long distances. It processes our food, regulates our traffic, reserves a seat on a plane, and keenly tracks our income tax discrepancies. And has finally realized the dream of Jules Verne - - Man On The Moon.

It is in this environment that the information professional finds a miriad of technical terminology permiating the library scene. He must now become a member of the new "technician breed." In so doing, he will be invited, approached and assaulted by numerous manufacturers, technical representatives and service personnel, all selling the "best mousetrap." He will have to become systems oriented, cost conscious, a critically analytic individual, capable of separating prototype from production or "sizzle from steak." For he is charged with the responsibility of providing information as requested. Many libraries of all types have uncommitted themselves to the book as such, and in so doing are constantly developing other systems, techniques and mediums to satisfy their information requirements.

In the beginning

Microforms in the early years met with considerable resistance by the user. He was quick to register reluctance and even disdain for it, in place of his bound volume. Some of the reasons were, images over-reduced (reduction too great), film resolution poor, cameras inadequate, extremely fine type faces in original material, reading equipment mediocre and lastly the "thread fumbling" required to place the reel film on the equipment. In spite of the early shortcomings, microfilm has become the practical solution for many library problems. Through microfilm, efforts are being made to provide permanent copies of material that would otherwise be restricted due to original expense and/or storage costs. It is making available material that is scarce and little known, or available only in costly reprints, and preserving that which is deteriorating or likely to. With the preservation and reproducing of newspapers, there is little doubt that microfilm is the answer. To this can be added reproduction of lengthy backfiles of scholarly primary and secondary journals in microform. There are many basic characterics of microfilm which account for its now being widely accepted by libraries. Technically, it is not difficult to produce because the materials and equipment needed are readily available. Microfilming is a straight-line cost process meaning that the cost of two copies is twice that of one copy and the cost for ten copies would be ten times the cost for one. In this way it is possible to produce at a reasonable rate just a few copies or even one copy as the need arises. No microfilm title is ever out of print for it can always be reproduced and replaced inexpensively. Microfilm has the durability and lasting of rag paper. It is accepted as a means of preserving permanent and vital records as well as important library resource material. Microfilm is in effect, the transistorization of the printed page. Currently microfilm images properly prepared

are the best of all micro images. It is superior to opaque microcard and microprints in the following ways:

1. It costs less.
2. It has a sharper image and, therefore, more readable.
3. The reading and printing equipment for this form is more highly developed and available.
4. It is easier and more convenient to use.
5. Copies may be made at low costs.
6. Reduction ratios can be higher and further minimize space requirements.

In the past several years a number of devices have been developed and refined to further the usefulness of microfilm as a library tool. They are the electrostatic continuous printer and the reader-printer machines provided by the major manufacturers to accommodate both continuous cartridge, reel and unit microfilm forms. The current 3–M, Kodak and Bell & Howell reader and reader/printer generation is producing acceptable results and can be found in wide usage. They all manufacture a basic line of equipment to accomodate the most popular standard microforms which are discussed in more detail later in this primer. By merely pushing a button the user will receive a paper copy of the micro image approximately 8½ x 11. The copies are produced one at a time at a uniformed cost per copy. When long continuous printouts are required it is recommended to use a Xerox Copyflow continuous printing service. This provides a dry, electrostatic, crisp, clear reproduction at speeds up to 40 ft. of paper per minute. It might be well to note that most reader-printers provide excellent copies when using negative film. IN THE PAST . . . . . many libraries have accumulated positive film collections. This trend as of late, has been reversing itself because of the high demand of printout required in user-oriented systems. This is particularly true in the special and/or scientific research libraries. Numerous technical data and literature is difficult to transpose manually and/or read on a screen. Chemical structures, graphs, charts and miscellaneous footnotes are usually necessary to the user and it seems only natural that an exact reproduction would be his first choice.

The problem facing information professionals of how to preserve continuity of all that is needed and still keep collections within a manageable size and reasonable building space, can be met largely by the use of microfilm and other non-print mediums.

A summary of the primary advantages recognized when microfilm is used in place of the original material whether it be newspapers, periodicals, government documents, reports, catalog files, patents, internal reports or other serial type publications is the following:

1. Microfilm preserves documents and rare materials. It permits complete sets to be established.
2. Copies of originals can be made readily accessible in facsimile form for all information purposes.
3. Microfilm conserves space and minimizes storage costs.
4. Microfilming is the least expensive process for producing a single copy.
5. Distribution of microform copies is simple and far less expensive then mailing the originals.
6. Binding costs are minimized.
7. Microfilm editions are never out of print.
8. Microfilm is a versatile information tool in that it can be used as a basis for printing future microforms and/or making enlargements to original size.

In the interest of being objective I shall enumerate the disadvantages in the use of microfilm as well. A user cannot easily browse microfilm to find what he wants. He must know in advance and in most cases is directed by indexes, abstracts and other secondary references. It is not uncommon for a specialist, that may have several favorite journals, to constantly peruse over a wide number of years casually searching for related material that will jog his mind or inspire curiosity. We now become dependent upon a piece of equipment with which to read and/or print the information. It might be well for librarians to note the greater the preponderance of collections in microform, the greater number of pieces of equipment they should have in order to offer full services to their patrons. It might, also, be well to note that in equipping a sizeable

collection in microform, one or two pieces of equipment over the required number would be considered prudent to insure proper service when machines are occasionally awaiting repair or maintenance. A disadvantage of the continuous microform is that frequently reel travel must be experienced in order to arrive at a particular reference that may be 80 or 90 feet in the reel. It is the practice of some micropublishers to place index content and other material quickly referred to in the front portion of the reel, thereby reducing the access time.

Microfilm is no longer confined to the reel as it once was. It is now widely available in unitized form commonly referred to as microfiche, microcard, aperture cards and jackets, which contain strips of film inserted. One might draw the analogy that the unitized microform is the counterpart of the punchcard in data processing and the continuous reel and/or cartridge form somewhat likened to the magnetic tape which is used for continuous processing. Large files of "like information" that will never or rarely ever have the sequence altered are best maintained and handled in a continuous reel or cartridge form. Information relatively short and usually self contained such as reports, specification tables, reviews, indexes and in some cases abstracts can be nicely accommodated on the unitized ready-access microfiche which permits random access as opposed to an in-line concept of the continuous reel. Now that the computer microfilm-marriage has occurred, it is apparent that they are both information tools and compatible in many ways.

A chief advance made from the reel or continuous film form is the microfiche, a unitized piece of microfilm available in several sizes. It is the opinion of the writer that of all sizes available, the 4 x 6 inch will definitely remain as a standard in the foreseeable future. A microfiche is comprised of a series of pages placed in one of several formats, with a title in large normal size type across the top dimension. It may be also dated and sequentially numbered to accommodate filing. It is also used for various other information that may be relative to the system in which it is employed. The microfiche was developed to overcome some of the inconvenience

of continuous reel film. The user handles microfiche as a unit type document, much like they would standard size file cards. A master microfiche from which subsequent copies are prepared can be made in different ways. A widely used method is a "step-and-repeat" camera. This has a programmed format, much like the format of data processing punchcards. Each page has an identity as to row and column. The most common microfiche formats used today contain approximately 60, 90 or 98 pages that may have 5 or 7 rows in 12, 14 or 18 columns. Another method of creating a master microfiche is known as the strip-up method where a series of continuous strips representing the rows are cut from a reel of film into a unitized standard sheet (4 x 6 inches or others). Once the master is prepared, large numbers of copies for distribution can be readily made. Microfiche systems will break down substantial bodies of information into small units and provides the opportunity for many people to use the file at one time. However, it is well to note that large bodies of like information in unitized form, unless machine handling is possible, will present a problem in maintaining file integrity. Imagine a scholarly Journal as lengthy as Academie Des Science, Comptes Rendus, 1835-1960 representing thousands of individual microfiche in several drawers of 4 x 6 form. The misfile would in time create a problem. In many instances the unit of information would be there, but not in the right sequence. Even with a professional file clerk the error rate would ultimately creep, and most likely cause the information specialist to abandon the unitized form for this application. The altetnative would be approximately a hundred fifty continuous reels or cartridges which could readily be inventoried and insure the journal file integrity with far greater ease. Obviously, if cartridge or reel number 10 were missing, it could readily be determined and one would know that perhaps volume 21-23 has been mislayed or lost. The micropublisher could replace this with little effort.

The writer has attempted to give you a rather wide brush or generalization of microforms from the earliest practical stage to the present. We have discussed briefly, advantages and disadvantages, economics, reading and printing capabilities, continuous and unitized microforms and the various analogies to other technology. NOW LET US BE MORE SPECIFIC . . . . .

Microfilming

Microfilm or microfilming is the photo-optical reduction of a document in some usual form, on 16 or 35mm or a sheet of film. The original may experience optical reductions from 10 x - 40 x diameter (1/10th to 1/40) with sufficient definition that it can be enlarged to its original size without appreciable loss of detail.

A microfilming system

In order to be effective, microfilm must really be part of a microfilming system. The form in which the film is used, stored, referred, retrieved and duplicated usually represents the total system and it is the system rather than the film to which we generally refer when we speak of microfilming. It might be well to note that microfilm in the early stages was used solely as a storage medium. However, the present state of development with appropriate pieces of equipment, coding and retrieval systems, and with efficient low cost reproductions, has developed it into one of our most efficient information tools.

Major advantages of microfilm

1. Microfilm conserves space.
2. Microfilm provides security.
3. Microfilm is tough and durable.
4. Microfilm can be coded for quick access.
5. Microfilm can be distributed at low cost.
6. Microfilm provides excellent facimilies.
7. Microfilm is usually less than the high cost of original or reprinted literature.
8. Microfilm has many forms to accomodate various systems.
9. Microfilm can reduce publishing time.
10. Microfilm is low cost for limited copies.

Microfilm space savings

This pamphlet, while a technology primer, does presume that all readers are aware that microfilm can achieve space saving of 95% plus as opposed to housing the original documents. Space savings while once the chief advantage of microfilming will in the next few years pale to insignificance as the full potential of microfilm technology is achieved.

Microfilm is durable

Silver halide microfilm processed under archival conditions as established by the National Bureau of Standards will last as long or longer as high quality rag content paper. Earlier microfilm sub-straits were largely nitrate, acetate and tri-acetate. A rather recent development and will no doubt become wide-spread in microfilm application is the polyester base films, which have many advantages. The dimensional stability is infinitely superior to all previously used film bases.

35mm microfilm

Early application of microfilm to libraries was largely in 35mm reels of positive reading film. Many newspapers and periodicals have been made available in this form. A number of larger libraries acquired their own microfilming cameras and performed in-house microfilming services to satisfy their information and space requirements. Libraries containing rare research material could ably provide microfilm copies to scholars and thereby preserve their original documents from excessive handling. They also were able to distribute film copies to national and international cooperating institutions.

35mm positive vs. negative

While many collections in the past have been in positive reading film, the trend is now toward negative film collections. This is because of wide spread reader printer devices as opposed to only a reading machine previously. Black print on white background facimilies are more readily made on present reader printers from negative film. Whereas, white print on black background is obtained when printing from positive film. The printout from positive film resembles photo-stats or have a black background with white letters. The exception to this is the "positive mode" Xerox microprinter recently introduced. This is a factory adjusted machine to provide a black print on white background from a positive film. This piece of equipment is the original Xerox 914 electro-static copier with a microfilm adapter affixed to the top side. There is also a reverse photo process available on a rather well manufactured microfiche reader that produces positive reading paper prints from a positive piece of microfiche.

Future of 35mm

This film size will be part of the microfilm scene for quite sometime. It will accommodate high volume microfilming of newspaper formats. Many libraries have substantial investments in periodical back files of journals and newspapers. The New York Times has in excess of 3500 institutions subscribing for their newspaper on 35mm film. The London Times is also popular along with many others. These institutions also have numerous MPE Recordak, "Kodak" readers that seemingly last forever and are trouble free. It accommodates both 16 and 35mm reel film for reading purposes only. Continuance of this film size will prevail mainly in the Public and Academic libraries. These institutions will also commence using 16mm reel film in both positive and negative.

16mm microfilm

Vastly improved film resolution, magazines, and cartridges, push button, non-threading reader printers and anxious information professionals are the reasons for the present level of 16mm microfilm success. Exposure to a Sears and Roebuck parts catalogue film system inspired a prominent information manager to experiment with his own library requirements. This occurred in 1963-65. These experiments subsequently led to the first significant application of secondary journals in 16mm cartridge microfilm. It was the Chemical Abstract Service. This program is now widespread and is a successful information tool. This user oriented system has since further developed to include all of the primary journals now published by the American Chemical Society. Other micropublishers are currently producing lengthy backfiles of many basic and voluminous journals. U.S. Patent Information, The Congressional Record, Catalogue Services, and numerous directories are also being micropublished and updated in this new easy to use, convenient system.

Advantages of 16mm cartridge systems

Film cartridges can be directly inserted and require no manual threading of film. This minimizes handling and damage to film. Microfilm can be coded at the filming stage to permit rapid retrieval. The retrieval can be push button, visual line control on the viewing screen and odometer readings. Push button print-out has enabled the user to have exact copies saving much time and transposition error pertaining to data or information desired. Duplicate library facilities sometimes called "satellite libraries" can readily be established to satisfy information requirements with user oriented cartridge systems. Institution or Company inter-library loan can be easily handled by the mailing of cartridges on a first class or special delivery basis.

Cost of 16mm cartridge systems

The present reader printers from major manufacturers that accommodate magazines and cartridges range from $1700.00 to $2400.00 in price. The Eastman Kodak Lodestar Reader Printer with a companion I.C. 4 image count keyboard has push button control when film is appropriately coded. It is approximately $7000.00. A newly announced 3M-400 Page Search Reader Printer to be delivered in the first quarter of 1970 is approximately $5000.00. The Kodak configuration is larger in size and is a two piece unit, the keyboard having columnar sets of keys whereas, the 3M 400 Page Search is a one piece configuration with a touch tone centralized keyboard somewhat like the new telephones. While the initial high cost of reader printers compared to older reading devices is apparent, the cost differential is insignificant when the printout and retrieval systems save valuable time for relatively high priced research personnel. Several thousand dollars is not uncommon for a complete backfile of bound volumes in a basic chemical title. The same backfile on film, in cartridges can be acquired for substantially less, which more than offsets the initial higher cost for capitol equipment. When one considers the numerous scientific backfiles required in a special library the difference between purchasing bound volumes vs. cartridges of film leaves a significant saving with which to cover the cost of reader printers and retrieval equipment. In addition, there is a re-occurring space savings factor which somewhat enhances the efficiency of the library.

Microfiche, a unit document

This microform promises to be on the scene for sometime into the future. Particularly the 4 x 6 inch size. It will however, have different specifications and formating with various reductions at the filming stage. The physical perimeters, however, will remain 4 x 6 inches. Microfiche became extremely popular when the

various government agencies adopted this form with which to disseminate numerous reports and specifications. This form, in the opinion of the writer, is the more desired where a relatively short amount of information such as thesis, patents, research papers, reports, graphs, charts, tables, and the like, need wide distribution. This form will accomodate approximately 100 pages on one 4 x 6 fiche. It is entirely manageable as well as practical to have one or a few fiche in an envelope properly identified to satisfy the information user. One might expect to see monographs, text books, and other publications up to several hundred pages economically and conveniently produced in this form. This form is also more economic and practical from the standpoint of establishing ones own personal library or information file. The average tabletop readers are priced in the hundred dollar category. A lap or leanback microfiche reader to be held much like a medium sized bound volume and referred to by some people as "the cuddly" will sell in the $50.00 range. When available, this should satisfy a very definite and individual market.

Micro-opaque forms

Micro-opaque forms which include the various size microcards and opaque backed film strips will continue to be used ocassionally. However, there is considerably less attention being given to this market. Equipment developed thus far for the reading and printing of this microform is rather scant and inadequate. There are, however, a number of excellent collections available in this form from international suppliers in the biological sciences. It is the opinion of the writer that caution and a thorough investigation should be made before making any substantial investment in a micro-opaque system.

Ultra or super microfiche

Ultra or super microfiche systems at present are very interesting but not practical. It will be quite some time before substantial collections will be avialable in this form. The reduction ranges are from 60X to 150X, and while they represent substantial space savings, they also pose the following shortcomings. A new generation of equipment for reading and printing must be developed and made available at reasonable prices. Existing collections at the commonly used reductions would have to be refilmed by micropublishers to accomodate a uniform system. The original microfilming of material in all likelihood will have to be conducted under "white-room" clean conditions in as much as dust becomes a factor. Dust will also continue to be a factor at the user level. While this has been overcome in part by the critical depth of focus designed into the equipment, it has not been completely satisfied. As of this date, the author has not seen a paper print-out equal to that which can be obtained from the normal reductions used in (21X) 16mm cartridge system now available. It will not currently satisfy the print-out requirements of subscripts, exponents and chemical structures so prevalant in scientific literature. At present ultrafiche will be adequate in those systems where the printing of the original documents can be controlled to accomodate the subsequent ultra filming reductions. For example, national automobile manufacturers and mail order firms may wish to disseminate replacement parts manuals to numerous repair agencies. Ultrafiche will also require a highly critical optic facility at the filming stage. The existing commercial microfilm cameras available to the micropublisher are woefully inadequate to perform this function. The materials being used to record these reductions at present are not the silver halide granular construction as we have known in the past. They are metallic oxides and require various types of mono-chromatic light sources for exposing the originals. Companies currently engaged in this ultra and super fiche technology are National Cash Register with their recently announced PCMI system, and Itek Corporation with their new RS film, to name but a few. As information professionals you may take heart in the fact that your children will certainly see this become a widespread reality.

Early confusion: hurrah!

It wasn't long before several micropublishers were successful in confusing the entire library scene with a variety of microforms. The following represents a list of those from which information professionals could choose, bearing in mind of course, each usually required a different piece of equipment with which to read and or print the microform. Compounding the confusion was the fact that a number of the following microforms could be had in either positive or negative.

1. 35mm reel microfilm.
2. 16mm reel microfilm (Limited use through 1950)
3. 3 x 5 micro-opaque cards. (75 x 125mm)
4. 5 x 8 micro-opaque cards.
5. 6 x 9 micro-opaque cards.
6. 4 x 6 micro-opaque cards. (105 x 148mm)
7. 3 x 5 microfiche. (75 x 125mm)
8. 9 x 12cm microfiche .
9. 4 x 6 microfiche. (105 x 148mm)
10. Tab size aperatur card. (IBM cards)

Lack of standardization

A thorough investigation of the eighteen National Microfilm Conventions held thusfar leaves one feeling that there is a noticeable lack of standardization. This naturally creates confusion in the minds of the potential users. One usually asks themselves the following questions:

1. Which system to use.
2. 35mm or 16mm continuous reels.
3. 16mm cartridges or magazines.
4. Unitized microfiche, 4 x 6 or other.
5. Positive or negative copies.
6. Micro-opaque forms. (Various sizes)
7. Readers or reader printers.
8. Silver or diazo.

9. File cabinets, shelving, or carrousels.
10. Maintenance and repair of equipment.
11. Is it manufactured nationally or internationally.
12. Will the system become obsolete soon?

There are still other questions that can be asked when establishing a microfilm system. However, we have covered the major ones.

Approximately two hundred companies are engaged in the manufacturing of microfilm equipment and services. For example, 16mm film can be used in several pieces of equipment if loaded in the appropriate cartridge, magazine, or cassette as specified by the manufacturer. (These terms are synonymous.) It would seem that the industry might have attempted to arrive at a universal cartridge rather then a variety of configurations. I must inject, the wheel or open reel is so simple it could hardly be improved upon. It manages to fit many pieces of equipment but must be manually threaded in most cases.

While the 4 x 6 microfiche is uniform in size, the number of pages and formats varies widely as to the reductions employed and the number of pages included on each microfiche. Presently the variety of coding systems used are not compatible with all machinery available. It varies with the manufacturer. There are a number of other examples on non-standardization which the users currently endure.

The development of standards has always been a difficult, time-consuming and thankless chore. The issue has been on the agenda at every gathering of microfilm users and manufacturers. Lack of standardization thus far, has been one factor which has impeded the growth of the microfilm industry as a whole. The National Microfilm Association is growing by leaps and bounds. It is certain that this organization, while having done much already, will continue to spearhead a concerted effort in the development of standards among manufacturers and suppliers of microfilm equipment and services. It is hoped that they will persue this diligently, bearing in mind the satisfaction of the end user and not compromising because of

equipment limitations. Historically, research and development has been "if it can be done crudely, it can be done smoothly". We might console ourselves with the standardization traumas the television and data processing industries have experienced. They now seem to be doing very well.

Do-me-jiggers, snap-rings, adapters, and gadgetry

Various pieces of plastic and pressed metal adapters, will be prevalent in the next few years. Their purpose will be to convert a machine designed for one micro-function to perform another. While many of these may have merit, they will at best be temporary measures and not necessarily adequate from a total systems concept. Many libraries have large investments in a particular generation of equipment and or microform. The quandry of "changing midstream" is ever likely with the geometric growth and development of microfilm technology. It is the opinion of the author that there is no one individual piece of equipment that can handle well, all basic standard microforms in the next few years. The various asundry attachments and adapters will perhaps offer some temporary solutions. In those cases where the total expense of a complete conversion from one microform to another is breathtaking or impossible, the more prudent and economic decision might be found in the use of various adapters with existing equipment. This is particularly worth noting where a large microfilm file exists in 35mm reel and they would prefer the convenience of cartridges. This would necessitate the purchase of cartridges and reloading from the reel film as well as providing the necessary adapters to the readers and reader printers that now exist. There is every likelihood that a 35mm cartridge reader and reader printer will be expressly designed for this in the foreseeable future. This type of reader printer (35mm cartridge) should have rather wide acceptance in both Public and Academic libraries as well as engineering drawing application.

Microfilm storage and filing systems

The most common method of microfilm storage has been the use of nine and ten drawer microfilm cabinets especially designed by one or more of the better office equipment manufacturers. These cabinets have usually been priced substantially higher than letter or legal size file cabinets because they were low-run manufactured items. It is certain that many of you will recall the "ghostly" little drawers at floor level which periodically was to have a deliquescent substance inserted which "supposedly" kept the moisture from permiating the reels of film contained therein. Whether it preserved the film or not, we shall never know. It did, however, usually succeed in rusting out the bottom of the cabinet. Oddly enough, they are no longer manufactured with this provision. Metal cabinets are still widely used and represent adequate storage. More recently, libraries are displaying the film in generally confined areas on narrow shelving much like you would find the bound volumes. It is not by coincidence that anumber of micropublishers have their 35mm film boxes designed and stamped in a vertical position resembling the spine of a bound volume. Many libraries are having "in-house" wall racks manufactured and arranging them in book like fashion with a reel sequence control much like the volume numbers were used to keep the bound volumes in order. Still another more recent method which permits the user to accomplish a great deal at a sitting location adjacent to the reader printer, is the carrousel file. This is supplied in many sizes by Information Design Corporation, Palo Alto, California. This latter approach has been very successful in housing the primary and secondary journals and various catalogue services. These include American Chemical Society publications, Biological Abstracts and Sweets Architectural Service, to name but a few. In the opinion of the author, to exercise any psychic restraint over the use and access of microfilm which the information professional would not have exercised in retaining the bound or unbound original, is

unwarranted. An aura of lock and keys, steel cases and security tends to leave a rather negative opinion in the mind of the user. In all likelihood, the replacement of microfilm would be much easier then the replacement of bound originals, should this become a factor.

The information process

The information process can be distinguished by two categories -- Those who create and disseminate information and those who are seeking information. In the next few years, greater cooperation will be achieved between both parties. An originator and disseminator of information would for example, be the American Chemical Society providing their primary and secondary chemical journals in both the original hard copy paper edition, and 16mm cartridge micropublished edition. Those seeking information would be Public, Academic, and Research Libraries along with private individual subscribers. It is evident that certain technical and mechanical functions performed historically to accomodate printing can be modified at no inconvenience to also comply with micro-publishing requirements. It would be quite natural for many large paper publishers to seriously commence micropublishing in conjunction with their present paper publishing. Computer microfilm output, (COM) the direct conversion of magnetic data processing tapes to microfilm via a cathode ray tube, will seriously affect the publishing methods that now exist. It is becoming apparent that to paper print and subsequently generate the microfilm edition by manually turning the printed pages can not, in the name of efficiency, continue. Computers now possess the capability of composition refinements, upper lower cases, justification, various fonts and type sizes. They will further add the advantage of information massage and selectivity into an infinite number of permeatations and shorten the time cycle required to make it available to the seeker.

In process

While the term "in process" has no doubt worn thin with regard to users and potential users of microforms, it is, in the opinion of the author, truly applicable to the following technological developments. To those information professionals currently enduring disadvantage with advantage, perhaps the following achievements will cause you to take heart, and be of good faith. You may expect to see standardization, refinements, and sophistication in the following accomplishments:

1. A uniform cartridge or magazine compatible with all 16mm cartridge reader-reader printers.
2. Standard coding and retrieval schemes.
3. Uniform visual targets or title pages with standard filming data on the film.
4. Shorter, almost instantaneous printout time on reader printers.
5. Dry white electro-static non-curling print out paper.
6. Greater film resolution.
7. Gradually greater film reductions practically employed.
8. Film and paper to better render half tone quality.
9. Wider use of polyester thin based films with fantastic environmental stability, permitting 200 feet of film plus, in the current 100 foot cartridge.
10. Color microfilm with color printout for effectiveness where essential.
11. And more important, increasing number of reliable manufacturers supplying fully automatic readers and reader printer equipment at lower cost. In tradition with the "Yankee" concept of competition, this can only provide

more and better for less.

12. Greater cooperation between information creators and information seekers.

While it is apparent that a good "five cent cigar" is gone forever, we can hope to see more efficient low cost reader printers to satisfy our information requirements.

How to keep current without trying

While this writing is intended as a primer to acquaint the reader with the current state of the art as applied primarily to Public, Academic and Research Libraries, it by no means should be construed and is obviously not definitive in all technical data. Each area of microfilm can be expanded upon substantially and would no doubt take a number of lengthy volumes. However, as information professionals it should prove helpful in orienting one to the present state of the art. The following publications and suggestions will be helpful in keeping one current with a minimum of time, expense, and effort.

1. Solicit publications from the National Microfilm Association (NMA) Annapolis, Md. They provide literature relative to many areas of microfilm technology and progress. They also participate and sponsor the National Microfilm Conventions which are held annually in a major city. The National Microfilm Convention, if one can attend, gives an annual updating to the full spectrum of microfilm technology.
2. The Microfilm Newsletter, P.O. Box 2154, Grand Central Station, New York City, N.Y. 10017 is a monthly report of the microfilm market, services and equipment. It is rather wide brush in treatment and can be read in five or ten minutes. A good investment for the time.

3. Encourage your professional societies to assign programs, schedule symposiums and work shops at your regularly attended meetings. This affords the precipitation of ones concentrated effort for the benefit of all, thereby saving a multiplicity of other peoples time.
4. Invite manufacturers representatives to visit your facilities and place them on the defensive by having all questions ready and answered to your satisfaction. Remember, you are buying, they are selling. One will have to compromise very little with the new refined equipment being made available by competitive manufacturing.
5. Call or write Princeton Microfilm Corporation, Princeton, N.J. Address your questions to Mr. Franklin D. Crawford, the author.

A prediction . . . . . By Franklin D. Crawford

The modern dynamic library will exist -- slick,streamlined, and responsive, doing todays work today, able to do tomorrows work tomorrow, uncluttered with yesterdays requirements or yesterdays thinking, a productive member of the Public, Academic and Industrial organization, whose success or failure it will contribute to each day.

The End